

REMARKS

Applicant respectfully requests further examination and reconsideration in view of the arguments set forth fully below. Claims 1-132 were previously pending. Of the above claims, claims 14-24, 36-46, 58-69 and 71-132 were previously withdrawn from consideration. In the Office Action mailed February 1, 2005, Claims 1-13, 25-35, 47-57 and 70 have been rejected. Accordingly, Claims 1-13, 25-35, 47-57 and 70 are currently pending. Favorable reconsideration is respectfully requested in view of the remarks below.

Rejections Under 35 U.S.C. § 102

Within the Office Action, Claims 1, 2, 4-7, 25, 26, 28, 31, 47, 48, 50 and 70 have been rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kitano et al., U.S. 2002/0075645, (hereinafter "Kitano"). Applicant respectfully traverses this rejection.

Summary Discussion

The present invention is directed toward a liquid cooling system. It is known that when liquid freezes, it expands in volume. When the liquid is water, its volume expands 10% when it freezes. In a rigid system, this expansion of the liquid can cause the system to fail causing leaks when thawed. Kitano solves this by including connector pipe with an expansible portion. When frozen, the pipe expands to accommodate the increased volume; the volume of the system necessarily increases. In sharp contrast, the present invention includes compressible objects inside the system (see claims 1, 25 and 47). When the liquid freezes and expands, the compressible objects are compressed; the volume of the system need not increase. **There is no teaching hint or suggestion in Kitano to include compressible objects in the system.** For at least this reason, the independent claims 1, 25, and 47 are allowable over the prior art.

Detailed Discussion

Specifically, it is stated within the Office Action, with reference to Fig. 10, that "the connector pipe 3 is made of a soft material, e.g. rubber or resin; and surface (*sic*) of the connector pipe 3 is covered with metal 18 around it, as shown in FIG. 10 [of the present invention]."

Applicant respectfully submits that though the connector pipe 3 is disclosed as being made of a soft material, e.g. rubber or resin, there is no teaching or suggestion of coupling one or more compressible objects with an inlet or outlet port. There is no teaching, hint or suggestion within Kitano that the soft material is compressible. Further, though, as stated, the connector pipe 3 is covered with metal 18 around it, the metal 18 is described as a "metal film" whose purpose is to prevent the contained liquid from diffusing through the soft material and "sneak[ing] away (*sic*) into the atmosphere;" the metal 18 is understood not to interfere with the expansion of the connector pipe 18 as illustrated in Figure 11. [Paragraph 64]

Kitano discloses a liquid cooling system for cooling a high heat generating body, such as a semiconductor element or the like, used in an electronic apparatus being small and thin in sizes, or a personal computer equipped with such the structure therein, comprising a pump of reciprocal movement type, a heat receiving jacket, a heat radiation pipe, and a connector pipe for connecting those parts with one another, wherein those are disposed to form a closed loop and are filled up with cooling liquid therein. [Abstract]. Kitano also discloses expansible portions of the connector pipe [Figures 2-10], such that "due to the pressure of the cooling liquid, the expansible portion is expanded . . . when the pressure falls down, the check valve is opened, and the cooling liquid within the connector pipe flows into an inside of the pump while the expansible portion turns back to the original position. [Kitano, paragraph 0048]. Kitano does not disclose, teach or suggest one or more compressible objects coupled to inlet and outlet ports. Kitano also does not disclose, teach or suggest that the one or more compressible objects reduce a volume of the inlet and outlet ports in an unpressured condition, or that pressure exerted on the compressible object increases a volume of the inlet port and the outlet port. Kitano also does not disclose, teach or suggest one or more compressible objects immersed in the enclosure. Instead, Kitano discloses flexible portions connected to walls of the connector pipe.

Further, Kitano is directed to a closed loop cooling system, in effect, an enclosure, having therein a pump capable of emitting pulsation therefrom. Within Kitano, any theoretical volume change due to the pump pulsation is termed ΔV_s and any theoretical volume change due to pressure in the flow passage outside the pump is termed ΔV_p . The operation of the cooling system of Kitano is predicated on the limitation that ΔV_s is *equal to or greater than* ΔV_p , meaning any volume change occurring within the enclosure of the system of Kitano during its operation will be *negative*. To clarify, let us say that the volume within the enclosure of the system of Kitano is equal to a reference volume while the system is not in operation; during the course of operation the volume may *decrease* from that reference volume, but due to the above

limitation, the volume within the enclosure *can never increase*. Though the flexible portions connected within the system of Kitano do expand, the volume of the enclosure of the system of Kitano does not expand. Furthermore, because of the nature of the system, any expansion of the flexible portions will occur at times during which the volume of the enclosure of the system is lower than the reference volume. Kitano does not disclose expanding a volume condition with fluid expansion during freezing.

In contrast to the teachings of Kitano, the method and apparatus of the present invention utilizes, inter alia, compressible objects to protect against expansion of water-based solutions when frozen. In such a system, pipes, pumps, and heat exchangers are designed to prevent cracking of their enclosures and chambers. In one embodiment, one or more compressible objects are coupled to inlet and outlet ports in an unpressured condition such that the compressible objects reduce a volume of the inlet and outlet ports and further wherein pressure exerted on the compressible object increases a volume of the inlet port and the outlet port. In another embodiment, one or more compressible objects are immersed in the enclosure.

The independent Claim 1 is directed to an apparatus for preventing cracking of a liquid system. The apparatus includes at least one heat exchanger; at least one inlet port extending through a first opening for conveying a fluid to a plurality of channels and passages; at least one outlet port extending through a second opening for discharging the fluid from the plurality of channels and passages; and one or more compressible objects coupled to the inlet and outlet ports in an unpressured condition such that the compressible objects reduce a volume of the inlet port and the outlet port and further wherein pressure exerted on the compressible object increases a volume of the inlet port and the outlet port. As described above, Kitano neither discloses, teaches nor suggests one or more compressible objects coupled to inlet and outlet ports. Also, Kitano neither discloses, teaches nor suggests that the one or more compressible objects reduce a volume of the inlet and outlet ports in an unpressured condition, or that pressure exerted on the compressible object increases a volume of the inlet port and the outlet port. For at least these reasons, the independent Claim 1 is allowable over the teachings of Kitano.

Claims 2-13 are all dependent on the independent Claim 1. As discussed above, the independent Claim 1 is allowable over the teachings of Kitano. Accordingly, the dependent Claims 2-13 are all also allowable as being dependent on an allowable base claim.

The independent Claim 25 is directed to an apparatus for preventing cracking of a liquid system. The apparatus comprises an enclosure; and one or more compressible objects immersed in the enclosure. As described above, Kitano neither discloses, teaches nor suggests one or more

compressible objects immersed in an enclosure. For at least these reasons, the Independent Claim 25 is allowable over the teachings of Kitano.

Claims 26-35 are all dependent on the independent Claim 25. As discussed above, the independent Claim 25 is allowable over the teachings of Kitano. Accordingly, the dependent Claims 26-35 are all also allowable as being dependent on an allowable base claim.

The independent Claim 47 is directed to a method of preventing cracking of a liquid system. The system includes one or more pumps and one or more heat exchangers. The method comprises the steps of providing an enclosure; and immersing one or more compressible objects in the enclosure. As described above, Kitano neither discloses, teaches nor suggests one or more compressible objects immersed in an enclosure. For at least these reasons, the Independent Claim 47 is allowable over the teachings of Kitano.

Claims 48-57 are all dependent on the independent Claim 47. As discussed above, the independent Claim 47 is allowable over the teachings of Kitano. Accordingly, the dependent Claims 48-57 are all also allowable as being dependent on an allowable base claim.

The independent Claim is directed to an apparatus for preventing cracking of a liquid system. The system includes one or more pumps and one or more heat exchangers. The apparatus comprises an enclosure, wherein the enclosure is capable of contracting and expanding between a minimum volume condition and a maximum volume condition with fluid expansion during freezing. As mentioned above, Kitano neither discloses, teaches nor suggests an enclosure capable of contracting and expanding between a minimum volume condition and a maximum volume condition with fluid expansion during freezing. For at least these reasons, the independent Claim 70 is allowable over the teachings of Kitano.

Rejections Under 35 U.S.C. § 103

Within the Office Action, Claims 3, 27 and 49 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kitano. Also within the Office Action, Claims 8-13, 29-35 and 51-57 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kitano. Applicant respectfully disagrees with this rejection.

Claims 3 and 8-13 are all dependent on the independent Claim 1. As discussed above, the independent Claim 1 is allowable. Accordingly, the dependent Claims 3 and 8-13 are all also allowable as being dependent on an allowable base claim.

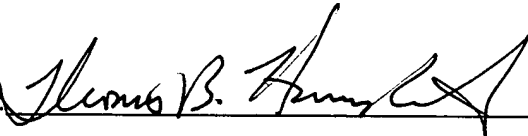
Claims 27 and 29-35 are all dependent on the independent Claim 25. As discussed above, the independent Claim 25 is allowable. Accordingly, the dependent Claims 27 and 29-35 are all also allowable as being dependent on an allowable base claim.

Claims 49 and 51-57 are all dependent on the independent Claim 47. As discussed above, the independent Claim 47 is allowable. Accordingly, the dependent Claims 49 and 51-57 are all also allowable as being dependent on an allowable base claim.

For the reasons given above, Applicant respectfully submits that the Claims 1-13, 25-35, 47-57 and 70 are now in a condition for allowance, and allowance at an early date would be appreciated. Should the Examiner have any questions or comments, the Examiner is encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
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Dated: 4-1-05

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UNITED STATES DEPARTMENT OF COMMERCE (157 OMB 1014)

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